



ORIGINAL ARTICLE

Acute Appendicitis: A prospective study comparing clinical appendicitis with histopathological appendicitis.

Hafiz Naimat Ullah¹, Rahmat Ullah Shah², Saad Salman Safir³, Muzzamil Sohail⁴, Hafsa Liaqat⁵, Sadia Shah⁶

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ABSTRACT... Objective: To compare clinical appendicitis with histopathological appendicitis. **Study Design:** Prospective Cross-sectional study. **Setting:** Department of Surgery, Lady Reading Hospital, MTI, Peshawar. **Period:** December 2019 to March 2020. **Material & Methods:** Out 106 patients with signs and symptoms of acute appendicitis 100 patients were included in the study. 6 patients were excluded because of incomplete data. Patients were examined, ALVARADO score was calculated and routine investigations were done. After open appendectomies all specimens were sent for histopathology. **Results:** Male to female ratio was 1.7:1, with a mean age of 25 ± 11 year. The most common presenting complain was right iliac fossa pain (98%), followed by nausea/vomiting (86%). The commonest signs elicited were right iliac fossa tenderness (100%), rebound tenderness (100%). Mean ALAVARADO score is 7.39 ± 1.03 . Intraoperative findings showed acutely inflamed appendix (90%), perforated appendix (7%) and normal (1%). The histopathology specimens showed acute appendicitis (88%), acute appendicitis with periappendicitis (8%) and normal histology (1%). **Conclusion:** Our study comparing clinical appendicitis with histological appendicitis with a negative appendectomy rate of only 1% suggests that acute appendicitis remains a clinical diagnosis and that timely accurate clinical diagnosis can prevent many complications associated with delayed/misdiagnosis of acute appendicitis. Laboratory evaluation and imaging especially CT may help in establishing diagnosis in equivocal cases but often leads to delay in diagnosis and also puts extra burden on the health care system.

Key words: Appendicitis, Alvarado Score, Appendectomy, Clinical Diagnosis, Histopathology.

INTRODUCTION

Appendix is a blind ended vestigial organ connected to the caecum whose physiological function is still to be discovered. Though, the appendix has got as such no role in everyday life, but it becomes clinically important when inflammation of appendix occurs, known as acute appendicitis. Acute appendicitis is one of the most common surgical emergency worldwide.¹ Statistics from the West shows that around 40,000 cases are diagnosed each year of acute appendicitis.² In USA, the risk of developing acute appendicitis is around 8.6% for male population and 6.7% for female population but in comparison the incidence is low in Asia and Africa because of changes in their diet.³

Acute appendicitis is often diagnosed clinically without any difficulty.⁴ The classical symptoms are pain in peri-umbilical region which then migrates to RIF along with nausea and vomiting. The signs to elicit appendicitis are RIF tenderness, rebound tenderness, Rovsing sign, Psoas sign and Obturator's sign. The patient may not have all the classical sign and symptoms.⁵ Shchatsko et al. reported pain in right iliac fossa with increased total leukocytes count and raised neutrophils levels was commonest presenting features in patients who underwent surgery for acute appendicitis.⁶ Rarely it may present as acute inflammation of scrotum.⁷ Diagnosis is more challenging in children with a very high rate of misdiagnosed acute appendicitis as reported by Almaramhy⁸ but using Alvarado score for

1. MBBS, FCPS, Assistant Professor Surgery, MTI Lady Reading Hospital.
2. MBBS, FCPS, F.MAS, F.BMS, Assistant Professor Surgery, MTI Lady Reading Hospital.
3. MBBS, Medical Officer, SKMHSRC Peshawar.
4. MBBS, FCPS, TMO Surgical C Unit, KTH.
5. MBBS, FCPS, TMO Surgical B Unit, KTH.
6. MBBS, FCPS, F.MAS, Assistant Professor, Kuwait Teaching Hospital Peshawar.

Correspondence Address:
Dr. Rahmat Ullah Shah
Department of Surgery
MTI Lady Reading Hospital.
surgeonrahmat@gmail.com

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diagnosis can be very helpful specially in children with recent onset of symptoms.⁹

Abdelahim et al.¹⁰ reported that patients with Alvarado score of ≥ 7 have positive findings during surgery. In cases of vague presentation admitting the patient for observation is prudent, and is associated with safety as well as increase the rate of accurate diagnosis.¹¹ In equivocal cases certain institutions are taking the help of Ultrasound as a first line imaging followed by Computed tomography as a second option in diagnosing appendicitis.^{12,13}

Despite advances in field of surgery, open appendectomy is the gold standard treatment of acute appendicitis. Timely surgery can save a person from catastrophic events such as appendicular mass, appendicular abscess, perforation, peritonitis and pelvic abscess.^{14,15} The histopathological analysis of the resected appendix can give definitive diagnosis which may or may not coincide with intraoperative findings. The histopathology of acute appendicitis shows transmural inflammation along with fissures in epithelium and neutrophils in mucosa.¹⁶ However clinical diagnosis sometimes does not coincide with the histopathology report and result in negative appendectomy.

Negative appendectomy is more common in females where the clinical diagnosis poses more challenge and is often difficult, especially in young females, where gynecologic issues can mimic acute appendicitis like ectopic pregnancy, ovarian torsion or ruptured ovarian cysts. Hence, negative appendectomies are more common in females.^{17,18}

The rationale of this prospective study was to ascertain the accuracy of clinical diagnosis of acute appendicitis against the gold standard histopathology aiming to timely and accurately diagnose the disease before the development of complications associated with delayed diagnosis and/or misdiagnosis such as perforated appendicitis with peritonitis and its dreadful sequelae.

MATERIAL & METHODS

This prospective cross-sectional study was conducted at Department of surgery, Lady Reading Hospital MTI-LRH, Peshawar, from December 2019 to March 2020 after obtaining approval from IREB/Ethical committee (Ref: No. 126/LRH/MTI dated 26/11/2019).

Patients with signs and symptoms suggestive of acute appendicitis had their basic demographics recorded. The surgeon examined and investigated the patients for acute appendicitis. The patients ALVARADO SCORE was calculated. CBC, urine R/E, Viral profile and ultrasound abdomen and pelvis, carried out in our unit on a routine basis, were also done.

After open appendectomy, intraoperative findings were noted and the samples were sent for histopathological examination. The samples recovered after appendectomy were preserved in the diluted formalin, Labels applied to the jars with correct identification and a brief history were sent to histopathology for the confirmation of acute appendicitis.

Statistical Analysis

The analysis of data was done on SPSS version 20 including the tables and figures.

RESULTS

During the course of the study, 106 appendectomies were performed. Data of 6 subjects were incomplete, so were excluded from the final results. The final sample size was 100 patients consisting of 63 (63%) males and 37 (37%) females.

The age of the subjects ranged from 16 years to 60 years with mean age of 25 (± 11) year, and with maximum frequency of 18 years. Majority of the patients belonged to Peshawar; however, some of the patients were referred from health care facilities of other cities. The demographics distribution is shown in Table-I.

Each patient was assessed from history and clinical examination. Majority of the patients presented to the emergency department with

symptoms of less than 24 hours duration, except for 4 which were referred patients with symptoms of more than 24 hours duration. The major presenting complaint was right iliac fossa pain, followed by anorexia, nausea/vomiting and fever shown in Table-II.

In order to confirm acute appendicitis, signs i.e. RIF tenderness, rebound tenderness, Rovsing's sign, Obturator sign and Psoas Sign were elicited, shown in Table-III.

Modified Alvarado score for each patient was calculated with mean of 7.39 (\pm 1.03) maximum of 9 and minimum of 5, and frequencies shown in Table-IV.

Although the diagnosis of acute appendicitis is purely a clinical one, investigations like total leukocyte count, Urine R/E and ultrasound abdomen & pelvis were performed to support the clinical diagnosis and rule out other differentials that mimics acute appendicitis. In urine R/E, pus cells above 3 and presence of RBCs were considered as positive. The frequency and percentages of these investigations are in Table-V. In ultrasonography, probe tenderness at McBurney's point and blind ended loop probably appendix visualization were considered as positive findings, shown in Table-VI. Within these positive findings, figures showing probe tenderness and appendix visualization are in Table-VII.

All the surgeries were performed by surgical residents under direct supervision of a consultant surgeon. The intraoperative impressions are shown in Table-VIII and the histopathological findings are shown in Table-IX.

DISCUSSION

The aim of our study was to evaluate the accuracy of pre-operative diagnosis of acute appendicitis in surgical D unit of lady reading hospital and confirm it with histopathology diagnosis. In the span of 4 months, 106 appendectomies were performed, out of which we have data of 100 appendectomies, consisting of 63 males and 37 females, with male to female ratio of 1.7:1. The age range was from 16 years to 60 years, with a

peak from 16 to 25 years. This data is comparable to other studies.¹⁹

Age (in Groups)	n=100(%)
16-20 years	43 (43%)
21-25 years	30 (30%)
26-30 years	11 (11%)
31-35 years	4 (4%)
36-40 years	5 (5%)
more than 40 years	7 (7%)
Gender	
Male	63(63%)
Female	37(37%)
Address	
Peshawar	86 (86%)
Bannu	6 (6%)
Charsadda	2 (2%)
Mardan	2 (2%)
Nowshara	1 (1%)
Mohmand Agency	1 (1%)
Khyber Agency	1 (1%)
Batagram	1 (1%)

Table-I. Demographics of the patients.

Presenting Complains	Present (%)
Right iliac fossa pain	98 (98%)
Vomiting/Nausea	86 (86%)
Fever	12 (12%)
Generalized Abdominal Pain	2 (2%)
Dysuria	1 (1%)

Table-II. Frequency of the presenting symptom.

Signs Elicited	Positive	Absent
Rebound tenderness	100.00%	0.00%
Right iliac fossa tenderness	100.00%	0.00%
Psoas Sign	23.00%	77.00%
Obturator Sign	12.00%	88.00%
Rovsing's Sign	14.00%	86.00%

Table-III. Frequency of the presenting Signs.

Alvarado Scoring	n=100
5	4 (4%)
6	20 (20%)
7	18 (18%)
8	49 (49%)
9	9 (9%)

Table-IV. Frequency of Alvarado scoring of the patients.

	Male n=63 (%)	Female n= 37 (%)	Total n=100 (%)
Total Leukocyte Count			
Elevated (above 11000)	50 (79.4)	29 (78.4)	79 (79.0)
Normal	13 (20.6)	8 (21.6)	21 (21.0)
Pus cells in Urine R/E			
Positive	22 (34.92)	19 (51.35)	41 (41.00)
Negative	21 (33.33)	13 (35.14)	34 (34.00)
Not done	20 (31.74)	5 (13.51)	25 (25.00)
RBCs in Urine R/E			
Positive	5 (7.94)	1 (2.70)	6 (6.00)
Negative	38 (60.32)	31 (83.78)	69 (69.00)
Not done	20 (31.74)	5 (13.52)	25 (25.00)

Table-V. Frequency & Percentages (according to gender) of laboratory findings.

Ultrasonographic Findings	Male n=63 (%)	Female n=37 (%)	Total n=100 (%)
Positive findings	19 (30.16)	13 (35.13)	32 (32.00)
Normal	39 (61.90)	23 (62.16)	62 (62.00)
Not done	5 (7.94)	1 (2.70)	6 (6.00)

Table-VI. Frequency of ultrasonographic findings.

Positive Findings on Ultrasound	Males n=19 (%)	Females n=13 (%)	Total n=32 (%)
Probe tenderness only	7 (36.84)	7 (53.85)	14 (43.8%)
Appendix visualized	12 (63.16)	6 (46.15)	18 (56.2%)

Table-VII. Frequency of detail positive findings on ultrasonography.

Intraoperative Findings	n=100 (%)
Acutely Inflamed Appendix	90 (90.0)
Perforated Appendix	7 (7.0)
Acute Suppurative Appendix	1 (1.0)
Normal Appendix	1 (1.0)
Inflamed Appendix with subserosal adhesions	1 (1.0)

Table-VIII. Frequency of Intraoperative findings.

Histopathologic Findings	n=100 (%)
Acute appendicitis	88 (88.0)
Acute appendicitis with periappendicitis	8 (8.0)
Acute appendicitis with fecolith	1 (1.0)
Abscess at tip of appendix	1 (1.0)
Acute appendicitis with Enterobius vermicularis	1 (1.0)
Normal Appendix	1 (1.0)

Table-IX. Histopathological findings.

Despite improvement in clinical advancements and availability of high-tech equipment, acute appendicitis still remains a clinical diagnosis. The diagnosis depends upon the presentation of the patient and the clinical experience of the surgeon. The most common presenting complains in our study were right iliac fossa pain followed by nausea/ vomiting, then generalized abdominal pain. This presentation is consistent with the studies.²⁰ The average duration of abdominal pain ranged from less than 24 hours. Those patients who presented in ER with generalized abdominal pain had span of more than 24 hours. The additional clinical signs elicited i.e. Right iliac fossa tenderness, Rovsing's sign and Psoas Sign is almost similar to other studies,²⁰ whereas the elicitation of other signs depends upon the experience of surgeon, position of appendix intraabdominally and pathological condition of appendix.

This study showed mean Alvarado score of 7.39 ± 1.03 , about 76% of patients' undergone appendectomies had the score above 6, whereas those patients having 5 and 6 score underwent appendectomies because there were clinically toxic looking with presence of rebound tenderness and raised TLC count persuade us to operate as to avoid complications. The only patient whose operative finding showed ovarian cyst and had normal appendix on histology, had a score of 6. About 76% of patient had score of 7 and above with highest frequency of 8, which is consistent with the scoring system.

To aid the diagnosis, CBC to check for raised TLC and Urine RE and ultrasound abdomen to rule out appendicitis mimic had been ordered. CBC revealed leukocytosis in 79 patients whereas the other 21 patients had their TLC within the normal range. Hence, leukocytosis can aid the diagnosis of acute appendicitis but normal leukocyte count cannot rule out acute appendicitis.²¹ Urine R/E was positive for pus cells in only 41 patients which can support urinary tract infection, but cannot rule out acute appendicitis because sometimes pelvic appendix in contact with urinary bladder causes this.

Emergency ultrasound revealed findings of acute appendicitis in only 32% of cases. In 62% cases, the ultrasound examination was unremarkable. In the remaining 6%, ultrasound was not performed. The accuracy of the emergency ultrasound is variable and it cannot be fully relied on.²²

Literature review demonstrates the negative appendectomy rate up to 15.6%²³, but in our study, it was 1%. The reason for the low negative appendectomy rate could be due to careful selection of the patients, experience of the surgeons and availability of imaging studies etc. Ninety-nine of these patients had histology proven acute appendicitis. The 1 patient who had a negative appendectomy was a female and intra-operative finding revealed an ovarian cyst in right ovary, which was mimicking acute appendicitis.

Finally, the histopathological analysis of the specimen is necessary to establish a tissue diagnosis, which may or may not coincide with the intraoperative diagnosis. The histopathological analysis of normal looking appendix may reveal microscopic evidence of ongoing acute appendicitis. Hence, the grossly normal looking appendix should be sent for histopathology. The other histopathological findings in a specimen of appendix may include presence of fecolith, worms and incidental carcinomas. Apart from inflamed appendix and appendicitis with peri-appendicular abscess, our study has revealed fecolith and *Enterobius vermicularis* in 1 % of cases. *Enterobius vermicularis* infested appendix has been reported to cause inflammation, leading to acute appendicitis.²⁴ Although, incidental neoplasms are reported in multiple studies to be in histopathology but we didn't report such finding in our study. The main limitation of our study is a smaller number of patients from a single institution. To support our data further studies are required on larger scale from multiple centers.

CONCLUSION

Our study comparing clinical appendicitis with histological appendicitis with a negative appendectomy rate of only 1% suggests that acute appendicitis remains a clinical diagnosis and that timely accurate clinical diagnosis can






prevent many complications associated with delayed/misdiagnosis of acute appendicitis. Laboratory evaluation and imaging especially CT may help in establishing diagnosis in equivocal cases but often leads to delay in diagnosis and also puts extra burden on the health care system
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AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Hafiz Naimat Ullah	Concept & Design.	
2	Rahmat Ullah Shah	Data analysis & Interpretation.	
3	Saad Salman Safir	Data collection.	
4	Muzzamil Sohail	Data collection.	
5	Hafsa Liaqat	Data collection.	
6	Sadia Shah	Critical revision of article.	